



Course: Geographic Information Systems

PEIMS Code : N1302805*

Abbreviation: GIS

Number of credits that may be earned: One (1.0) Credit

Brief description of the course (150 words or less):

Geographic Information Systems is a course designed to introduce students to Geographic Information Systems and Remote Sensing technology through academic study and applied instruction. Students will be introduced to terminology and concepts relating to GIS/RS technology and will apply these concepts through the use of GIS software programs. Students will participate in structured, applied learning exercises taken from existing data sources, as well as conduct new study of these data sources through self-driven study and analysis. An ongoing emphasis of the use of GIS and RS technology in various career fields will enhance the applied learning activities and exercises. Skill based training in GIS is designed to introduce students to the use of GIS software and software extensions through academic study and extensive applied instruction. Students will be introduced to terminology and concepts relating to GIS and apply these concepts through the use of industry-standard software.

Essential Knowledge and Skills of the course:

(These should be presented in the same format as the State Board of Education approved Texas Essential Knowledge and Skills (TEKS). You may find samples of this format in Chapters 110 – 128 of 19 Texas Administrative Code (TAC) at <http://www.tea.state.tx.us/rules/tac/index.html>.)

- (1) The student demonstrates knowledge and appropriate use of computer hardware components, software programs, and their connections. The student is expected to:
 - (A) demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components;
 - (B) compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices;
 - (C) make decisions regarding the selection, acquisition, and use of software taking into consideration its quality, appropriateness, effectiveness, and efficiency;
 - (D) delineate and make necessary adjustments regarding compatibility issues including, but not limited to, digital file formats and cross platform connectivity.
- (2) The student uses data input skills appropriate to the task. The student is expected to:
 - (A) demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, mouse, or digital photos by appropriately incorporating such components into the product and
 - (B) use digital keyboarding standards for the input of data.
- (3) The student demonstrates knowledge and understanding of what GIS is and the use of GIS technology in different career fields. The student is expected to:



- (A) demonstrate knowledge and proficiency in identifying the historical and contemporary developments in GIS;
 - (B) demonstrate knowledge and proficiency in identifying the basic components of GIS;
 - (C) demonstrate knowledge and proficiency in identifying appropriate application of GIS technologies in different career fields.
- (4) The student demonstrates knowledge and appropriate use of database software. The student is expected to:
- (A) demonstrate knowledge and appropriate use of database software to design and construct a relational database using a Geographic Data Model;
 - (B) demonstrate proficiency in using joins, hyperlinks, and relational linking within the database;
 - (C) demonstrate proficiency in data depiction and classification;
 - (D) demonstrate proficiency in transferring data from different sources into a database for storage and retrieval;
 - (E) demonstrate proficiency in identifying characteristics of maps and spatial data;
 - (F) demonstrate proficiency in identifying and using geographical scales, coordinates, and specific map projections.
- (5) The student demonstrates knowledge and appropriate use of Spatial Databases and sources. The student is expected to:
- (A) demonstrate knowledge and the ability to identify and utilize digital terrain models, digital orthophotoquadrangles, soil geographic databases, land use and land cover, digital imagery, vegetation, hydrographic spatial data, and demographic and socio-economic data;
 - (B) demonstrate knowledge and appropriate use of GIS software as a tool for spatial analysis.
- (6) The student demonstrates knowledge and appropriate use of GIS software. The student is expected to:
- (A) demonstrate knowledge and the ability to login and launch GIS software;
 - (B) determine the appropriate software tool from GIS to use for a given task or project;
 - (C) demonstrate proficiency in creating queries and spatial queries for finding features, borders, centroids, and networks as well as determining distance, length and surface measurements and shapes.



(7) The student demonstrates knowledge and appropriate use of GIS data collection devices. The student is expected to:

- (A) demonstrate knowledge and appropriate use of a Geographical Positioning System (GPS) receiver by initializing and preparing it for data collection;
- (B) demonstrate proficiency in the use of a GPS receiver to collect geographical coordinates;
- (C) demonstrate proficiency in transferring data from a GPS device to a personal computer.

(8) The student acquires electronic information in a variety of formats, with appropriate supervision. The student is expected to:

- (A) acquire information in and knowledge about electronic formats including text, audio, video, and graphics;
- (B) use a variety of resources, including the internet, foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group GIS projects.

(9) The student uses appropriate computer-based productivity tools to create and modify solutions to problems. The student is expected to:

- (A) apply project management guidelines in designing and developing GIS projects;
- (B) use visual organizers to design solutions such as flowcharts or schematic drawings;

(10) The student delivers the product electronically in a variety of media, with appropriate supervision. The student is expected to:

- (A) publish information in a variety of ways including, but not limited to, printed cartographic reports and PowerPoint displays;
- (B) publish information in a variety of ways including, but not limited to, software, Internet documents, and video; and
- (C) present GIS information in oral presentations using graphs, charts, and maps.

(11) The student learns the employability characteristics of a successful worker in the modern workplace. The student is expected to:

- (A) identify career development and entrepreneurship opportunities in the field of geographical information systems industry;
- (B) apply competencies related to resources, information, interpersonal skills, and systems of operation in the geographical information technology industry;



- (C) demonstrate knowledge of personal and occupational safety practices in the workplace;
 - (D) identify employers' expectations, appropriate work habits, and good citizenship skills; and
 - (E) plan and conduct supervised geographical information system / global positioning system experiences.
- (12) The student will define and describe maps, reports, and graphs. The student is expected to:
- (A) create map displays with industry standard legends;
 - (B) utilize symbols, scaling, and other map elements; and
 - (C) generate reports and graphs.

Description of the specific student needs this course is designed to meet:

This course will provide work-related training for individuals who intend to go into various career pathways, such as engineering, transportation systems, city planning, community development, environmental sciences, technology, space sciences, marketing, natural resources, health, law enforcement, cartography, real estate development, geology, architecture, disaster recovery, first responder, etc. Additionally, this course gives instruction in the use of data from satellite technologies and promotes critical thinking skills in analyzing data. It promotes collaboration, problem solving and communication skills as well.

Major resources and materials to be used in the course:

GIS is a combination of

- Robust hardware – Networked PC lab
- Powerful software - ESRI supported
- Special Data

GIS does not involve “canned maps” but, instead, it involves the ability to construct maps showing what you want from your collected data in the way you define. The software draws the integration of data: geographic coordinates (“where things are”) and sets of attributes (“what things are like”), processed according to rules set by the user.

This requires high computer power, since you can draw an infinitely variable set of coordinates at infinitely variable scales. This introductory class will include class work using standards based textbooks, hands on projects, and case studies to learn basic GIS terminology, career field applications, and the use of GIS specific software for project development and management.

Required activities and sample optional activities to be used:

Students will master GIS concepts through the use of GIS software to create solutions to problems presented by the instructor and through the completion of a major project.

Sample Projects:

- (1) Using project management skills, students will plan a GIS project related to location of water services within the community. Students will:



(A) identify and collect necessary data to be used in the project. This includes fire hydrant locations, water towers, major water lines, cutoff valves, etc.;

(B) use ESRI supported software and any necessary extension programs to manipulate the project data and complete any relevant analyses for the project;

(C) organize findings into an appropriate GIS layout, import this layout into a word document and summarize these findings into a concise written report;

(D) communicate project findings via oral presentation to school and community representatives.

(2) Using project management skills, students will plan a GIS project related to bus route planning for the school district. Students will:

(A) identify and collect necessary data to be used in the project. This includes school locations, existing routes, types of roads traveled, miles traveled on each route, expenses involved with bus operation, etc.;

(B) use ESRI supported software and any necessary extension programs to manipulate the project data and complete any relevant analyses for the project;

(C) organize findings into an appropriate GIS layout, import this layout into a Word document and summarize these findings into a concise written report;

(D) communicate project findings via oral presentation to school representatives.

Methods for evaluating student outcomes:

Required qualifications of teachers:

The teacher shall be certified in Technology Education, Trade and Industrial Education, Business Education or Social Studies Composite and be familiar with the appropriate technology required to teach the course content.

Additional information (optional):